

Summary of Seabird Bycatch in Alaskan Groundfish Fisheries, 1993 through 2004.

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Introduction

This document provides a summary of seabird bycatch in federal groundfish fisheries in Alaskan waters from 1993 through 2004. Information that describes fisheries, vessel operations, observer sampling methodology, or analytical processes for estimation are available elsewhere. The purpose of this report is to make the estimates of seabird bycatch in federal groundfish fisheries available annually to the public.

Estimates of seabird bycatch from Alaskan groundfish fisheries are completed by NOAA Fisheries' Alaska Fisheries Science Center staff each year using two sources of information. The first is data obtained from the North Pacific Groundfish Observer Program. These data are composed of, among other information, total catch and species composition from direct monitoring of fishing operations by NMFS-certified groundfish observers. The second source of information is from the Alaska Regional Office catch accounting system that reports total catch. Observer methods are detailed in the [North Pacific Groundfish Observer Program Documents](#) while a description of the catch accounting database is available at [Alaska Groundfish Catch Accounting System](#).

Groundfish fisheries include fixed gear (pot and demersal longline) and trawl gear in federal waters of the Alaskan EEZ. Fishing takes place in three areas defined in North Pacific Fisheries Management Council Fishery Management Plans – the Aleutian Islands (AI), Bering Sea (BS), and the Gulf of Alaska (GOA) (Figure 1). The Alaskan Groundfish fishery is described in detail in the Alaska Groundfish Fisheries Final Programmatic SEIS (2004).

Fishery Interactions

Seabird bycatch summarized here is reported by the species or reporting groups developed in consultation with the U.S. Fish and Wildlife Service Region 7 (Anchorage, Alaska) (Table 1). At least 23 individual species, represented as a species or unidentified category, have been taken in the groundfish fisheries, including Laysan albatross (*Diomedea immutabilis*), black-footed albatross (*Diomedea nigripes*), short-tailed albatross (*Phoebastria albatrus*), Northern fulmar (*Fulmarus glacialis*), sooty shearwater (*Puffinus griseus*), short-tailed shearwater (*Puffinus tenuirostris*), unidentified storm petrel (*Oceanitidea*), herring gull (*Larus argentatus*), glaucous gull (*Larus hyperboreus*), glaucous-winged gull (*Larus glaucescens*), black-legged kittiwake (*Larus tridactyla*), red-legged kittiwake (*Larus brevirostris*), thick-billed murre (*Uria lomvia*), common murre (*Uria aalge*), tufted puffin (*Fraterecula cirrhata*), king eider (*Somateria spectabilis*), loon unidentified (*Gaviidae*), grebe unidentified (*Podicipedidae*), cormorant unidentified (*Phalacrocoracidae*), jaeger/skuua unidentified (*Stercorarius spp.*), tern unidentified (*Sternidae*), guillemot unidentified (*Cepphus spp.*), auklet/murrelet unidentified (*Alcidae*: several genera).

Bycatch in Longline Fisheries: Longline, or hook and line, fisheries in Alaskan waters are demersal sets that target groundfish or halibut. Observer coverage is not required in the halibut fishery, so information reported here are for demersal groundfish longline fisheries only, although that information does include some operations where halibut was retained due to individual fishing quota shares being available while fishing for groundfish. Longline fisheries in the BS and AI Regions are typically undertaken by vessels that are larger, stay at sea longer (up to 30 days), have onboard processing abilities, target Pacific cod (*Gadus macrocephalus*) and Greenland turbot (*Reinhardtius hippoglossoides*), use auto-bait systems, and deploy up to 55,000 hooks per day (Melvin et al. 2001). Conversely, longline vessels in the GOA typically are smaller, have shorter trip lengths (6 days), deliver bled fish on ice to shoreside processing plants, target sablefish (*Anoplopoma fimbria*), use tub or hand bait gear, and deploy up to 10,500 hooks per day (Melvin et al., 2001).

Between 1993 and 2004 the average annual bycatch in the combined Alaskan longline fisheries was 13,144 birds (Table 2). Over this period the average annual bycatch rates (birds per 1,000 hooks) were 0.065 in the AI and BS areas and 0.021 in the GOA (Table 2). Those rates have dropped in the last few years, with the running 5-year average now (2000-2004) at 0.035, 0.036, and 0.010 for the AI, BS, and GOA Regions respectively. Large inter-annual variation in seabird bycatch has been common, even after the implementation of the first generation of seabird avoidance regulations in 1997 (Figure 2). Recently, seabird bycatch has trended downward. In 2002 many freezer-longliners fishing in the BSAI adopted the recommendations from studies completed by Melvin et al. (2001). Paired streamer lines meeting specific performance standards had proven to be very effective in reducing seabird bycatch during this study. NMFS completed the revisions to seabird avoidance regulations that made seabird avoidance measures mandatory for all longline vessels in February 2004. Among other requirements, vessels larger than 55 feet length over all must use paired streamer lines except in certain weather conditions. Total seabird bycatch is the result of overall fishing effort and catch rate. These factors tend to track each other in the AI Area, while catch rates are declining and effort is tending upward in the BS. In the GOA effort was low and bycatch rates were their highest in 1998. Since then, effort has nearly doubled while bycatch rates have dropped 17-fold (Table 2, Figures 3-5).

Seabird bycatch is highest in the BS Area, where fishing is predominantly cod freezer longliners (Melvin 2001) and lower in the AI and GOA Areas (Tables 2 – 5, Figure 6). In each area Northern fulmar is the predominant seabird taken (Figure 7 - 9). To date, the lowest bycatch of seabirds occurred in 2002 (Figures 2 and 6). Bycatch rates in all three Regions have been decreasing since highs in the 1998-1999 period.

Seabird bycatch in the AI Region is composed primarily of Northern fulmar (54%; Figure 7) followed by 20% Laysan albatross. Few black-footed albatross are taken in the AI Region. Unidentified birds comprise the next largest component of the species composition (11%), with gulls and shearwaters accounting for another 10%. While the BS Region has the highest bycatch of seabirds, it is composed primarily of Northern fulmar (60%) and has overall low numbers of albatross (about 2%; Figure 8). Gulls comprise about 22%, followed by unidentified birds (11%) and shearwaters (4%). The GOA Region is similar to the AI in that the species composition is still primarily Northern fulmar (46%) and albatross make up more of the species composition (Figure 9). Laysan albatross are about 12% and black-footed albatross are about 20% of the

seabirds taken. Given bycatch rates, total effort, and species composition of albatross (Laysan and black-footed) in each Region, the overall estimated bycatch of albatross is very similar among Regions with 287, 211, and 300 albatross taken in the AI, BS, and GOA regions respectively (Figure 10). The 1993 through 2004 averages for Northern fulmar by region (AI, BS, and GOA) are 644, 6,546, and 384.

Pot: Seabird bycatch from groundfish pot fishing has traditionally been very limited. The overall average bycatch in this fishery, 1993 through 2004, is 55 seabirds (Table 6). That trend continues, with only 5 birds observed taken in 2004, extrapolating up to an estimated 60 total mortalities. No albatross have been taken in pot gear. Northern fulmars account for 37 of the 60 estimated birds in 2004. These birds obviously did not enter the pot while it was actively fishing on the bottom and are more likely the result of striking the vessel and gear before the pot is set.

Trawl: On trawl vessels only, observers use whole haul, partial haul, or basket sampling to record prohibited species bycatch and determine the species composition of the haul (AFSC 2004). With rarer species, such as salmon or halibut, it is important to maximize the sample size when possible. Conversely, when sampling for species composition the observer is limited by the amount of fish that can be sorted, weighed, and counted. Observers are often required to use two of these three sample types in a single haul in order to best accommodate the goals of prohibited species and species composition sampling (prohibited species are those that are not allowed to be retained and processed by groundfish operations and include salmon, herring, crab, and halibut – CFR 50 Section 679.21) (AFSC 2004).

Observers have been instructed to use the largest sample available when monitoring for seabird bycatch. Sample size was recorded when seabirds were found in the observer's sample. When no birds were found the actual sample size used while monitoring for seabirds was not recorded due to the direction to use the largest sample size available. Unfortunately, not all observers used their largest monitored sample when looking for seabirds, which has complicated the analysis. Starting in 2004, observers were directed to record the sample size used when monitoring for seabirds regardless if any were found. However, for 1993 through 2003 it is not known with certainty which sample size was used to monitor for seabird bycatch in groundfish trawl operations. Because we know of a few cases where the largest sample available was not used, seabird bycatch has been calculated using two alternative methods based on the largest (alternative1) and smallest (alternative2) sizes of sampling effort recorded for fish species (Tables 7 – 9, Figure 11). In each of these two alternative calculation methods, a separate ratio estimator was used to bind the results of the catch ratios and variances of data from the three different sample sizes into arbitrary equal samples which were then inflated upwards to the total catch effort of the NMFS blend program. This provides two sets of estimates of seabird bycatch for trawlers.

While we cannot state with certainty which of the 2 estimates is more accurate, it is highly unlikely that all observers did the opposite of what they were instructed to do. It is much more likely that a few of the many observers deployed each year simply made a mistake. Therefore, while seabird bycatch on trawl vessels lies somewhere between the two estimates provided, alternative 1 (largest available sample size) probably provides the best estimate of seabird bycatch in the trawl fleet based on direct observer sampling (see caveat below).

As noted above, this issue was resolved for data collections beginning in the 2004 season. The sample size used to monitor for seabirds in all hauls is now recorded whether a bird was taken or not. The 2004 estimates were run as alternatives 1 and 2 (sample sizes for hauls with no seabird takes were ignored: alt 1 defaults to the largest sample size available whereas alt 2 defaults to the smallest) and method 2 (estimation procedure used the recorded sample size for all hauls). Method 2 aligns closely with the estimates from alternative 1 (Tables 7 – 9). Seabird bycatch is lowest in the GOA Region and generally higher in the BS, with the AI being intermediate but highest in 1996, 2001, and 2003 (Figure 12). Northern fulmars are again the most common species taken, constituting about 45% of the overall seabird bycatch in the combined groundfish trawl fleet when using the 1993-2004 average annual estimates (Figure 13). That composition changes to about 76% when the 2000 through 2004 average annual estimates are used (Tables 7 – 9).

Another source of mortality for seabirds on trawl vessels are the trawl door cables (warps) and the cable that run between the net monitoring device and the vessel (trawl sonar cable or third wire). To date, only anecdotal information is available from North Pacific groundfish fisheries, so the extent of the mortality from this cause is uncertain. A special project for observers was implemented in 2004 and expanded for the 2005 and 2006 fishing seasons. We are currently developing estimates on total trawl and trawl sonar effort and will use the 2004 through 2006 observer data to better characterize interaction rates and mortalities. A collaborative project was started in 2004 between the Alaska Fisheries Science Center and the Pollock Conservation Cooperative to promote development of seabird mitigation measures for groundfish catcher processor vessels. Funds were obtained from the NOAA Fisheries National Cooperative Research Program to assist with the development of these measures. Parallel to that, the Pollock Conservation Cooperative had been collaborating with Washington Sea Grant to conduct some preliminary work on interaction rates and further develop protocols drafted by Sea Grant, AFSC and University of Washington staff to be able to develop a rigorous field test of these measures. Washington Sea Grant coordinated with the Pollock Conservation Cooperative (with support from the AFSC and USFWS) to conduct such a rigorous test of these gear under commercial fishing conditions in the summer of 2005.

Acknowledgements

Reporting of seabird bycatch numbers would not be possible without the dedication and hard work of the many North Pacific Groundfish Observers deployed each year. Their efforts are here gratefully acknowledged. Staff of the North Pacific Groundfish Observer Program work to support observers in the field, and to ensure proper quality control measures are integrated into every step of the program, working to ensure that these data are of the highest quality possible. They too deserve credit for their diligence. Mike Perez of the National Marine Mammal Lab conducts the analysis of seabird bycatch each year, with partial financial support from the Alaska Region Protected Resources Division.

Citations

AFSC (Alaska Fisheries Science Center). 2004. North Pacific Groundfish Observer Manual. Available from: North Pacific Groundfish Observer Program. AFSC, 7600 Sand Point Way N.E., Seattle, Washington, 98115.

NMFS. 2004. Alaskan Groundfish Fisheries Final Programmatic Supplemental Environmental Impact Statement. U.S.DOC, NOAA, NMFS, Alaska Region, P.O. Box 21668, Juneau AK 99802-1668

Melvin, E.F., J.K. Parrish, K.S. Dietrich, and O.S. Hamel. 2001. Solutions to seabird bycatch in Alaska's demersal longline fisheries. Washington Sea Grant Program. Project A/FP-7. Available on loan from the National Sea Grant Library, and from publisher. WSG-AS-01-01.

Web links

For additional information on seabird regulations, biological opinions, and other related matters, refer to the Alaska Region Protected Resources Division [Alaska Seabird Incidental Take Reduction Program and Longline Gear Seabird Avoidance Measures](#).

For information on North Pacific Groundfish Observer Program protocols see <http://www.afsc.noaa.gov/refm/observers>

For general fisheries management information also see the North Pacific Fisheries Management Council website at <http://www.fakr.noaa.gov/npfmc>

For research on seabird avoidance measures and seabird distribution refer to the Washington Sea Grant website at <http://www.wsg.washington.edu/research/living/seabirds.html>

Table 1. Species and species group categories used in tables 3 through 9. Any species or species group heading not listed in a table means that there was no bycatch in that category¹.

Species/species Group	Includes	Scientific Name
Short-tailed Albatross	n/a	<i>Phoebastria albatrus</i>
Laysan Albatross	n/a	<i>Diomedea immutabilis</i>
Black-footed Albatross	n/a	<i>Diomedea nigripes</i>
Unidentified Albatross	Short-tailed, Laysan, or black-footed.	n/a
Northern Fulmar	n/a	<i>Fulmarus glacialis</i>
Shearwaters	Unidentified Shearwater	<i>Puffinus</i> spp
	Sooty Shearwater	<i>Puffinus griseus</i>
	Short-tailed shearwater	<i>Puffinus tenuirostris</i>
Unidentified Procellariid	All of the above	Procellariiformes
Gull	Unidentified gulls	<i>Laridae</i>
	Herring gulls	<i>Larus argentatus</i>
	Glaucous gulls	<i>Larus hyperboreus</i>
	Glaucous-winged gulls	<i>Larus glaucescens</i>
Alcid	Unidentified alcids,	<i>Alcidae</i>
	Guillemots	<i>Cephus</i> spp.
	Murres	<i>Uria</i> spp.
	Puffins	<i>Fratrurcula</i> spp.
	Murrelets and auklets	Several genera
Other Seabird	Miscellaneous birds – could include:	
	Loons	<i>Gaviidae</i>
	Grebes	<i>Podicipedidae</i>
	Cormorants	<i>Phalacrocoracidae</i>
	Seaducks	<i>Anatidae</i>
	Jaeger/skuas	<i>Stercorariidae</i>
	Kittiwakes	<i>L. tridactyla</i> , <i>L. brevirostris</i>
	Terns	<i>Sternidae</i>
Storm petrels	<i>Oceanitidae</i>	
Unidentified Seabird	All of the above	

¹ A complete list of the species and species group categories used by North Pacific Groundfish Observers while monitoring is available in the Groundfish Observer Manual (AFSC 2004).

Table 2. Annual estimates of fishery effort, total birds taken, catch rates, and percent hooks observed in Alaskan groundfish demersal longline fisheries by fishery management region and for all Alaskan waters combined, 1993 through 2004.

Area and Year	Effort (No. of hooks in 1,000s)	Number of Birds	95% Confidence Bounds	Incidental catch rate (Birds per 1,000 hooks)	Percent of hooks observed
Aleutian Islands					
1993	37,009.6	2,485	1,927-3,204	0.067	21.1
1994	17,171.1	1,440	1,170-1,771	0.084	25.2
1995	11,846.7	1,531	1,170-2,004	0.129	23.2
1996	11,885.3	791	573-1,088	0.066	25.8
1997	13,177.2	958	698-1,318	0.073	18.9
1998	20,388.2	1,770	1,472-2,129	0.087	25.8
1999	14,444.4	1,901	1,266-2,854	0.132	19.8
2000	28,366.2	1,545	1,144-2,087	0.054	20.8
2001	34,066.4	1,177	894-1,547	0.035	20.8
2002	8,646.9	66	41-107	0.008	31.2
2003	11,294.7	372	236-586	0.033	11.5
2004	10,700.0	124	81-193	0.012	16.9
Aleutian Island Average Annual Estimates					
1993-2004	18,249.7	1,180	1,071-1,300	0.065	21.6
2000-2004	18,614.8	656	548-788	0.035	20.2
Bering Sea					
1993	85,605.4	5,364	4,683-6,142	0.063	26.2
1994	118,840.4	9,393	8,446-10,448	0.079	24.2
1995	131,313.3	17,944	16,664-19,323	0.137	24.1
1996	131,832.2	7,814	7,004-8,716	0.060	23.3
1997	176,756.6	20,187	18,404-22,145	0.114	21.2
1998	156,154.2	22,912	21,185-24,780	0.147	23.0
1999	145,818.6	10,817	9,610-12,175	0.074	25.0
2000	165,450.9	16,775	15,288-18,408	0.101	23.0
2001	192,878.7	8,860	7,993-9,818	0.046	20.9
2002	208,784.3	3,802	3,324-4,348	0.018	22.1
2003	268,874.0	4,794	4,325-5,314	0.018	22.8
2004	259,288.4	4,694	4,284-5,141	0.018	19.8
Bering Sea Average Annual Estimates					
1993-2004	170,133.8	11,113	10,781-11,455	0.065	22.6
2000-2004	219,055.8	7,785	7,397-8,192	0.036	21.6
Gulf of Alaska					
1993	56,431.2	1,322	1,090-1,606	0.023	10.2
1994	49,464.6	531	419-676	0.011	4.9
1995	42,775.5	1,544	1,341-1,779	0.036	12.6
1996	33,416.5	1,649	1,273-2,137	0.049	10.7
1997	28,756.6	474	339-663	0.016	9.7
1998	30,039.7	1,587	1,016-2,480	0.053	7.9
1999	32,277.3	964	765-1,216	0.030	8.5

Area and Year	Effort (No. of hooks in 1,000s)	Number of Birds	95% Confidence Bounds	Incidental catch rate (Birds per 1,000 hooks)	Percent of hooks observed
2000	35,806.0	782	484-1,262	0.022	6.4
2001	34,505.2	475	318-710	0.014	7.7
2002	37,472.5	238	143-396	0.006	9.2
2003	53,190.3	482	297-783	0.009	6.5
2004	56,099.1	161	84-307	0.003	5.0
Gulf of Alaska average annual estimates					
1993-2004	40,852.6	851	766-946	0.021	8.1
2000-2004	43,414.6	428	337-544	0.010	6.8
All Alaska fishery management regions combined					
1993	179,046.2	9,171	8,225-10,226	0.051	20.1
1994	185,473.0	11,364	10,361-12,467	0.061	19.2
1995	185,935.5	21,019	19,657-22,477	0.113	21.4
1996	177,134.0	10,254	9,309-11,291	0.058	21.1
1997	218,699.3	21,619	19,803-23,607	0.099	19.5
1998	206,582.1	26,269	24,380-28,306	0.127	21.1
1999	192,540.3	13,682	12,248-15,285	0.071	21.8
2000	229,623.0	19,102	17,504-20,849	0.083	20.1
2001	261,450.3	10,512	9,569-11,544	0.040	19.1
2002	254,903.7	4,106	3,612-4,667	0.016	20.5
2003	333,359.0	5,648	5,102-6,252	0.017	19.8
2004	326,087.5	4,979	4,554-5,444	0.015	17.2
All Alaska fishery management regions combined average annual estimates					
1993-2004	229,236.2	13,144	12,782-13,516	0.057	19.9
2000-2004	281,085.2	8,869	8,452-9,307	0.032	19.3

Table 3. Estimated incidental take and actual number of seabirds observed taken in the Aleutian Islands fishery management region groundfish demersal longline fishery, 1993 through 2004. Numbers in parenthesis (shaded rows) are the 95% confidence intervals.

Year	No. Obs.	Albatrosses			Northern Fulmar	Shearwaters	Unid. Procel-larids	Gulls	Alcids	Other Sea-birds	Unid. Seabirds	Totals
		Laysan	Black-footed	Unid.								
1993	550	571 (437-746)	12 (5-29)	355 (228-555)	1,017 (611-1,695)	0	0	184 (133-253)	3 (1-13)	0	343 (157-746)	2,485 (1,927-3,204)
1994	388	307 (228-414)	37 (17-78)	76 (50-116)	434 (300-628)	27 (8-94)	0	24 (21-30)	0	0	535 (348-823)	1,440 (1,170-1,771)
1995	390	316 (176-567)	23 (11-50)	26 (16-43)	1,006 (689-1,469)	22 (10-48)	10 (2-42)	99 (62-156)	0	0	29 (14-61)	1,531 (1,170-2,004)
1996	222	106 (72-155)	20 (6-70)	34 (18-64)	160 (100-254)	304 (148-623)	2 (1-7)	23 (13-42)	0	0	142 (78-258)	791 (573-1,088)
1997	179	270 (185-394)	8 (2-36)	10 (3-32)	599 (373-963)	20 (5-73)	9 (3-28)	10 (3-32)	0	0	32 (16-64)	958 (698-1,318)
1998	460	449 (295-683)	4 (1-18)	0	638 (474-859)	125 (83-188)	4 (1-18)	167 (109-257)	0	4 (1-15)	379 (243-591)	1,770 (1,472-2,129)
1999	399	231 (177-300)	17 (7-40)	0	1,535 (933-2,527)	9 (2-41)	4 (1-18)	100 (48-210)	0	0	5 (1-23)	1,901 (1,266-2,854)
2000	325	196 (144-268)	11 (3-35)	5 (1-23)	1,149 (772-1,712)	27 (13-56)	0	110 (71-171)	0	0	47 (24-92)	1,545 (1,144-2,087)
2001	245	126 (76-209)	0	0	938 (671-1,311)	65 (40-103)	0	43 (24-76)	0	0	5 (1-22)	1,177 (894-1,547)
2002	66	47 (25-86)	0	0	10 (4-25)	5 (1-23)	0	4 (1-15)	0	0	0 (1-107)	66 (41-107)
2003	74	135 (63-290)	0	0	216 (118-394)	0	0	0	0	21 (6-74)	0 (236-586)	372 (236-586)
2004	24	52 (27-100)	0	0	28 (13-61)	16 (3-78)	0	10 (3-32)	0	0	18 (8-40)	124 (81-193)
Average Annual Estimates												
1993-2004	na	234 (205-267)	11 (7-16)	42 (31-59)	644 (550-755)	52 (35-76)	2 (1-5)	65 (54-78)	0 (0-1)	2 (1-6)	128 (98-167)	1,180 (1,071-1,300)
2000-2004	na	111 (86-145)	2 (1-7)	1 (0-5)	468 (366-598)	23 (15-35)	0	33 (24-47)	0	4 (1-15)	14 (8-23)	656 (548-788)

Table 4. Estimated incidental take and actual number of seabirds observed taken in the Bering Sea fishery management region groundfish demersal longline fishery, 1993 through 2004. Numbers in parenthesis (shaded rows) are the 95% confidence intervals.

Yr	No. Obs.	Albatrosses				Northern Fulmar	Shearwaters	Unid. Procelarids	Gulls	Alcids	Other Sea-birds	Unid. Seabirds	Totals
		Short-tailed	Laysan	Black-footed	Unid.								
1993	1,392	0	49	0	0	3,153	65	0	647	11	4	1,435	5,364
			(29-83)			(2,582-3,849)	(34-123)		(430-974)	(4-36)	(1-16)	(1,200-1,716)	(4,683-6,142)
1994	2,312	0	4	0	0	4,555	656	351	1,718	4	4	2,101	9,393
			(1-20)			(3,954-5,247)	(495-870)	(247-499)	(1,333-2,214)	(1-20)	(1-18)	(1,568-2,814)	(8,446-10,448)
1995	4,442	0	148	43	12	8,811	308	474	3,892	4	45	4,207	17,944
			(104-210)	(19-96)	(5-31)	(7,884-9,847)	(221-429)	(295-760)	(3,268-4,635)	(1-17)	(24-84)	(3,538-5,003)	(16,664-19,323)
1996	1,780	4	130	0	27	5,571	185	14	1,484	46	50	303	7,814
		(1-19)	(79-216)		(13-53)	(4,806-6,457)	(118-288)	(6-37)	(1,250-1,762)	(14-144)	(25-103)	(235-389)	(7,004-8,716)
1997	3,944	0	125	4	3	15,187	354	169	3,429	0	9	907	20,187
			(86-183)	(1-19)	(1-15)	(13,505-17,079)	(206-609)	(112-257)	(2,667-4,408)		(3-28)	(606-1,356)	(18,404-22,145)
1998	5,390	8	982	5	4	14,955	1,018	17	4,252	53	45	1,573	22,912
		(3-24)	(720-1,339)	(1-23)	(1-17)	(13,391-16,701)	(846-1,226)	(8-39)	(3,626-4,985)	(31-90)	(23-89)	(1,288-1,926)	(21,185-24,780)
1999	2,894	0	313	0	0	6,466	492	418	2,172	4	47	905	10,817
			(253-387)			(5,412-7,725)	(398-609)	(224-778)	(1,802-2,613)	(1-15)	(22-101)	(628-1,305)	(9,610-12,175)
2000	3,543	0	260	5	10	9,879	533	86	4,454	5	16	1,527	16,775
			(172-391)	(2-21)	(3-29)	(8,573-11,384)	(411-693)	(54-137)	(3,852-5,150)	(1-22)	(8-35)	(1,171-1,992)	(15,288-18,408)
2001	1,742	0	281	5	5	4,595	394	96	2,431	2	33	1,018	8,860
			(197-400)	(1-21)	(1-21)	(3,901-5,412)	(293-528)	(61-153)	(2,049-2,884)	(1-8)	(15-74)	(758-1,367)	(7,993-9,818)
2002	859	0	5	0	5	695	149	20	2,536	10	17	365	3,802
			(1-24)		(1-22)	(585-826)	(102-219)	(7-53)	(2,095-3,071)	(3-32)	(7-40)	(276-482)	(3,324-4,348)
2003	1,049	0	47	10	0	2,748	289	14	1,373	11	45	257	4,794
			(23-94)	(3-32)		(2,408-3,137)	(220-379)	(4-46)	(1,088-1,734)	(4-29)	(26-76)	(192-343)	(4,325-5,314)
2004	894	0	37	11	3	1,934	710	97	1,260	39	23	580	4,694
			(18-74)	(4-36)	(1-10)	(1,661-2,253)	(558-904)	(59-160)	(1,055-1,505)	(20-76)	(11-51)	(448-750)	(4,284-5,141)
Average Annual Estimates		1	198	7	6	6,546	429	146	2,471	16	28	1,265	11,113
1993-2004	na	(0-3)	(170-231)	(4-12)	(4-9)	(6,258-6,847)	(393-470)	(117-187)	(2,327-2,623)	(11-23)	(22-36)	(1,163-1,376)	(10,781-11,455)
2000-2004	na	0	126	6	4	3,970	415	63	2,411	14	27	749	7,785
		(99-160)	(3-13)	(2-9)	(3,651-4,317)	(365-472)	(48-81)	(2,221-2,618)	(8-22)	(19-38)	(648-866)	(7,397-8,192)	

Table 5. Estimated incidental take and number of seabirds observed taken in the Gulf of Alaska fishery management region groundfish demersal longline fishery, 1993 through 2004. Numbers in parenthesis (shaded rows) are the 95% confidence intervals.

Year	No. Obs.	Albatrosses			Northern Fulmar	Shearwaters	Unid. Procel-larids	Gulls	Alcids	Other Sea-birds	Unid. Sea-birds	Totals
		Laysan	Black-footed	Unid.								
1993	318	128 (78-211)	29 (15-57)	3 (1-14)	842 (648-1,094)	59 (31-114)	0	45 (23-90)	0	3 (1-11)	213 (131-346)	1,322 (1,090-1,606)
1994	126	169 (106-269)	7 (2-22)	8 (3-24)	258 (181-368)	26 (10-70)	0	30 (7-127)	0	0	33 (13-84)	531 (419-676)
1995	374	68 (42-109)	239 (181-317)	378 (290-493)	529 (381-733)	40 (20-81)	6 (1-25)	105 (67-166)	0	4 (2-11)	175 (120-256)	1,544 (1,341-1,779)
1996	250	155 (104-233)	665 (490-903)	0	674 (424-1,071)	15 (4-52)	0	121 (30-498)	0	0	19 (6-57)	1,649 (1,273-2,137)
1997	74	31 (7-127)	97 (51-187)	0	281 (177-449)	8 (2-24)	0	47 (24-93)	0	0	10 (3-33)	474 (339-663)
1998	184	241 (117-495)	321 (125-825)	4 (1-18)	951 (506-1,788)	13 (4-42)	0	57 (29-116)	0	0	0	1,587 (1,016-2,480)
1999	159	214 (147-312)	184 (91-370)	0	242 (165-354)	50 (21-118)	0	249 (145-430)	0	9 (2-43)	16 (5-55)	964 (765-1,216)
2000	72	96 (47-195)	155 (89-271)	0	317 (140-716)	0	0	180 (55-592)	0	0	34 (7-174)	782 (484-1,262)
2001	45	69 (29-165)	73 (36-146)	17 (4-86)	191 (116-314)	20 (4-99)	0	96 (25-365)	6 (1-29)	0	3 (1-14)	475 (318-710)
2002	51	0	33 (17-65)	0	107 (52-219)	0	0	81 (27-237)	0	0	17 (6-44)	238 (143-396)
2003	37	12 (5-30)	156 (58-418)	0	216 (113-410)	0	0	41 (13-128)	41 (7-230)	0	16 (3-80)	482 (297-783)
2004	17	31 (11-88)	24 (10-58)	0	0	0	0	93 (35-244)	0	0	13 (3-62)	161 (84-307)
Average Annual Estimates												
1993-2004	na	101 (82-125)	165 (131-208)	34 (26-44)	384 (320-460)	19 (13-28)	1 (0-2)	96 (67-136)	4 (1-19)	1 (1-4)	46 (35-61)	851 (766-946)
2000-2004	na	42 (26-67)	88 (57-137)	4 (1-17)	166 (112-246)	4 (1-20)	0	98 (53-182)	9 (2-45)	0	17 (7-41)	428 (337-544)

Table 6. Estimated incidental take and actual number of seabirds observed taken in the demersal pot fishery in Alaskan waters, 1993 through 2004, all fishery management regions combined. Numbers in parentheses (shaded rows) are the 95% confidence intervals.

Year	No. Obs.	Northern Fulmar	Shearwaters	Unid. Procel-larids	Gulls	Alcids	Unid. Seabirds	Totals
1993	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0
1995	6	9 (3-33)	7 (1-33)	0	3 (1-15)	19 (4-92)	0	38 (15-103)
1996	9	80 (27-235)	0	2 (1-8)	0	0	7 (2-30)	89 (33-238)
1997	4	16 (6-43)	0	0	0	11 (2-52)	0	27 (10-68)
1998	2	18 (4-92)	0	0	15 (3-73)	0	0	33 (10-114)
1999	47	166 (95-290)	9 (2-43)	14 (5-35)	0	0	0	189 (114-313)
2000	1	0	0	0	0	0	42 (9-207)	42 (9-207)
2001	3	14 (4-52)	0	0	3 (1-12)	0	0	17 (6-53)
2002	6	18 (8-42)	0	0	0	0	3 (1-13)	21 (10-44)
2003	10	91 (36-230)	4 (1-16)	0	0	59 (12-290)	0	154 (63-372)
2004	5	60 (20-183)	0	0	0	0	0	60 (20-183)
Average Annual Estimates								
1993-2004	na	39 (27-58)	2 (1-5)	1 (1-3)	2 (1-6)	7 (2-25)	4 (1-17)	55 (40-79)
2000-2004	na	37 (20-69)	1 (0-3)	0	1 (0-2)	12 (2-58)	9 (2-41)	60 (32-107)

Table 7. Estimated incidental take and actual number of seabirds observed taken in the Aleutian Islands fishery management region groundfish trawl fleet, 1993 through 2004. Alternate methods of take estimation are based on largest (Alt 1¹) or smallest sample size (Alt 2 – shaded area) available during seabird monitoring. Sample size used for monitoring seabirds was recorded in 2004 for all samples regardless of birds taken (Meth 2).

Year	No. Obs.	Est. Type	Laysan Albatross	Northern Fulmar	Shearwaters	Gulls	Alcids	Unid. Seabirds	Totals
1993	3	Alt 1	0	0	219	0	0	0	219
		Alt 2	0	0	486	0	0	0	486
1994	0	Alt 1	0	0	0	0	0	0	0
		Alt 2	0	0	0	0	0	0	0
1995	0	Alt 1	0	0	0	0	0	0	0
		Alt 2	0	0	0	0	0	0	0
1996	1	Alt 1	0	0	0	0	0	115	115
		Alt 2	0	0	0	0	0	229	229
1997	4	Alt 1	99	0	0	0	0	42	141
		Alt 2	193	0	0	0	0	1,692	1,885
1998	9	Alt 1	285	14	0	5	0	0	304
		Alt 2	371	36	0	9	0	0	416
1999	21	Alt 1	8	223	6	0	0	0	237
		Alt 2	22	258	158	0	0	0	438
2000	7	Alt 1	0	72	0	0	0	0	72
		Alt 2	0	428	0	0	0	0	428
2001	11	Alt 1	7	254	360	0	0	0	621
		Alt 2	119	499	488	0	0	0	1,106
2002	8	Alt 1	2	171	0	0	0	0	173
		Alt 2	30	518	0	0	0	0	548
2003	6	Alt 1	121	202	0	44	44	0	411
		Alt 2	230	202	0	86	86	0	604
2004	3	Alt 1	0	287	0	0	0	0	287
		Alt 2	0	344	0	0	0	0	344
		Meth 2	0	287	0	0	0	0	287
Average Annual Estimates									
1993 –	n/a	Alt 1	44	102	49	4	4	13	216
2004		Alt 2	81	190	94	8	7	160	540
2000–	n/a	Alt 1	26	197	72	9	9	0	313
2004		Alt 2	76	398	98	17	17	0	606

¹ Observers were instructed to use the largest sample size available when monitoring for seabirds. Alt 1 likely represents a closer approximation of estimated incidental takes.

Table 8. Estimated incidental take and actual number of seabirds observed taken in the Bering Sea fishery management region groundfish trawl fleet, 1993 through 2004. Alternate methods of take estimation are based on largest (Alt 1¹) or smallest sample size (Alt 2 – shaded area) available during seabird monitoring. Sample size used for monitoring seabirds was recorded in 2004 for all samples regardless of birds taken (Meth 2).

Year	No. Obs.	Estimate Type	Albatross		Northern Fulmar	Shearwaters	Unid.			Other Seabirds	Unid. Seabirds	Totals
			Laysan	Unid.			Procel- larids	Gulls	Alcids			
1993	20	Alt 1	0	176	0	126	2	0	1	0	49	354
		Alt 2	0	516	0	323	769	0	2	0	1,381	2,991
1994	45	Alt 1	0	0	36	88	0	4	0	0	6	134
		Alt 2	0	0	3,832	3,083	0	414	0	0	285	7,614
1995	19	Alt 1	0	40	28	0	0	0	11	0	53	132
		Alt 2	0	60	1,495	0	0	0	10,963	0	779	13,297
1996	18	Alt 1	0	0	49	2	6	3	3	0	11	74
		Alt 2	0	0	1,139	88	1,102	268	43	0	178	2,818
1997	50	Alt 1	0	0	5	101	0	0	120	0	156	382
		Alt 2	0	0	319	799	0	0	120	0	678	1,916
1998	35	Alt 1	0	0	67	344	1	1,967	109	3	10	2,501
		Alt 2	0	0	3,922	1,353	163	781	543	2,489	1,108	10,359
1999	131	Alt 1	0	0	395	125	0	0	313	3	10	846
		Alt 2	0	0	8,687	1,198	0	0	528	79	970	11,462
2000	93	Alt 1	0	0	219	16	3	42	2	0	63	345
		Alt 2	0	0	10,101	3,075	156	117	333	0	599	14,381
2001	129	Alt 1	2	0	283	14	13	7	2	4	161	486
		Alt 2	26	0	10,847	406	1,077	288	68	297	721	13,730
2002	58	Alt 1	0	0	1,687	7	0	8	8	13	113	1,836
		Alt 2	0	0	5,876	597	0	72	879	123	474	8,021
2003	69	Alt 1	0	0	190	2	2	27	7	0	2	230
		Alt 2	0	0	24,988	128	173	0	481	0	527	26,297
2004	65	Alt 1	0	0	145	46	0	2	128	5	13	339
		Alt 2	0	0	7,476	2,961	0	485	1,116	1,226	1,708	14,972
		Meth 2	0	0	147	46	0	2	128	5	13	341
Average Annual Estimates												
1993-2004	n/a	Alt 1	0	18	259	73	2	172	59	2	54	639
Alt 2		2	48	6,557	1,168	287	202	1,256	351	784	10,655	
2000-2004	n/a	Alt 1	0	0	505	17	4	17	29	4	71	647
Alt 2		5	0	11,858	1,433	281	193	575	329	806	15,480	

¹ Observers were instructed to use the largest sample size available when monitoring for seabirds. Alt 1 likely represents a closer approximation of estimated incidental takes.

Table 9. Estimated incidental take and actual number of seabirds observed taken in the Gulf of Alaska fishery management region groundfish trawl fleet, 1993 through 2004. Alternate methods of take estimation are based on largest (Alt 1¹) or smallest sample size (Alt 2 – shaded area) available during seabird monitoring. Sample size used for monitoring seabirds was recorded in 2004 for all samples regardless of birds taken (Meth 2).

Year	Total Catch	Est. Type	Northern Fulmar	Shearwaters	Unid. Procel-larids	Alcids	Unid. Seabirds	Totals
1993	1	Alt 1	0	19	0	0	0	19
		Alt 2	0	56	0	0	0	56
1994	0	Alt 1	0	0	0	0	0	0
		Alt 2	0	0	0	0	0	0
1995	2	Alt 1	0	14	0	0	1	15
		Alt 2	0	27	0	0	3	30
1996	1	Alt 1	0	0	2	0	0	2
		Alt 2	0	0	2	0	0	2
1997	1	Alt 1	73	0	0	0	0	73
		Alt 2	73	0	0	0	0	73
1998	1	Alt 1	98	0	0	0	0	98
		Alt 2	98	0	0	0	0	98
1999	2	Alt 1	0	0	0	67	0	67
		Alt 2	0	0	0	268	0	268
2000	1	Alt 1	62	0	0	0	0	62
		Alt 2	121	0	0	0	0	121
2001	1	Alt 1	25	0	0	0	0	25
		Alt 2	48	0	0	0	0	48
2002	3	Alt 1	206	0	0	0	0	206
		Alt 2	246	0	0	0	0	246
2003	2	Alt 1	186	0	0	0	0	186
		Alt 2	186	0	0	0	0	186
2004	1	Alt 1	0	0	0	4	0	4
		Alt 2	0	0	0	43	0	43
		Meth 2	0	0	0	3	0	3
Average Annual Estimates								
1993-2004	n/a	Alt 1	54	3	0	6	0	63
		Alt 2	64	7	0	26	0	97
2000-2004	n/a	Alt 1	96	0	0	1	0	97
		Alt 2	120	0	0	9	0	129

¹ Observers were instructed to use the largest sample size available when monitoring for seabirds. Alt 1 likely represents a closer approximation of estimated incidental takes.

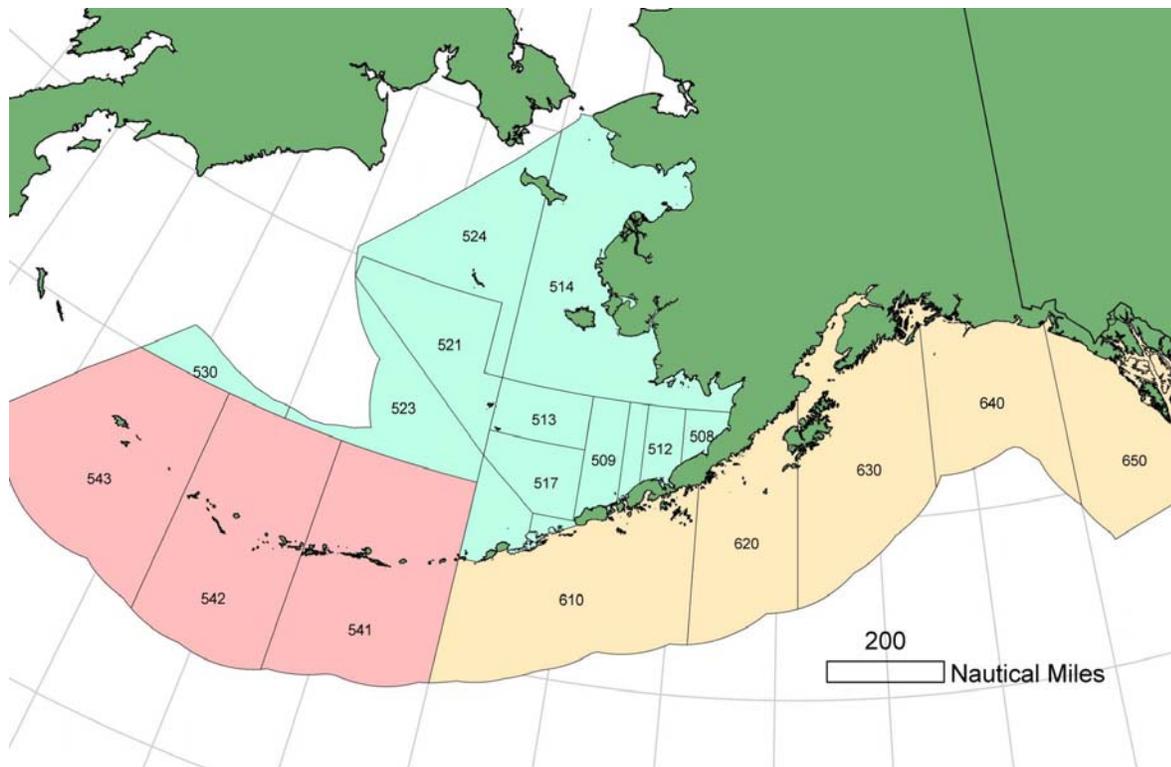


Figure 1. NMFS Statistical Areas and Fishery Management Regions for the Groundfish Fisheries in Alaskan Waters showing the Aleutian Islands Region (541 – 543), Bering Sea Region (508 – 530), and the Gulf of Alaska Region (610 – 650).

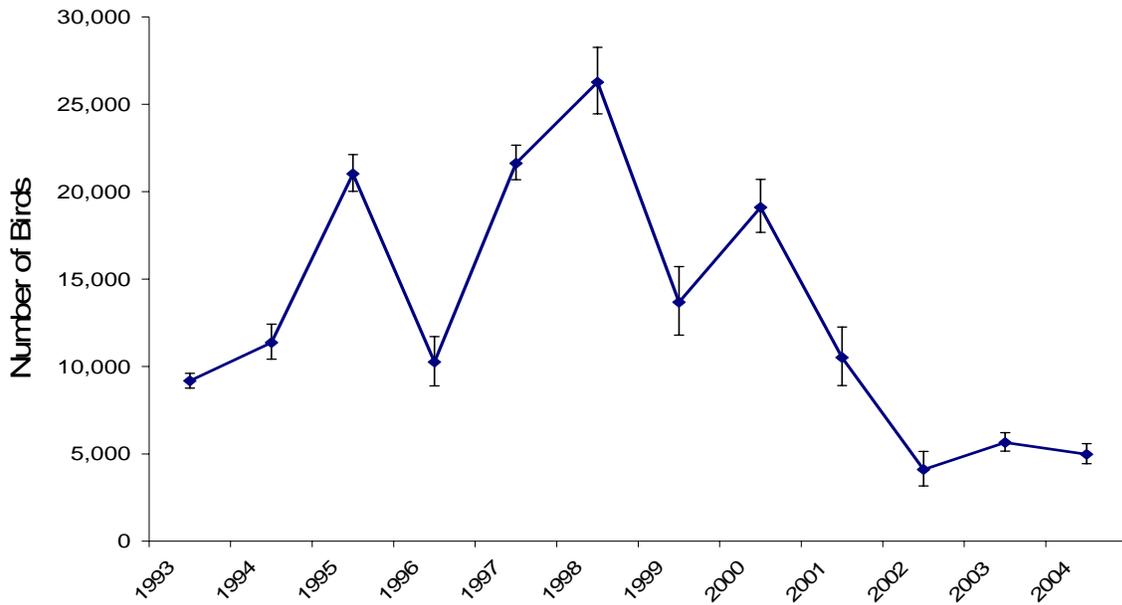


Figure 2. Total incidental take of seabirds in Alaskan combined demersal longline groundfish fisheries.

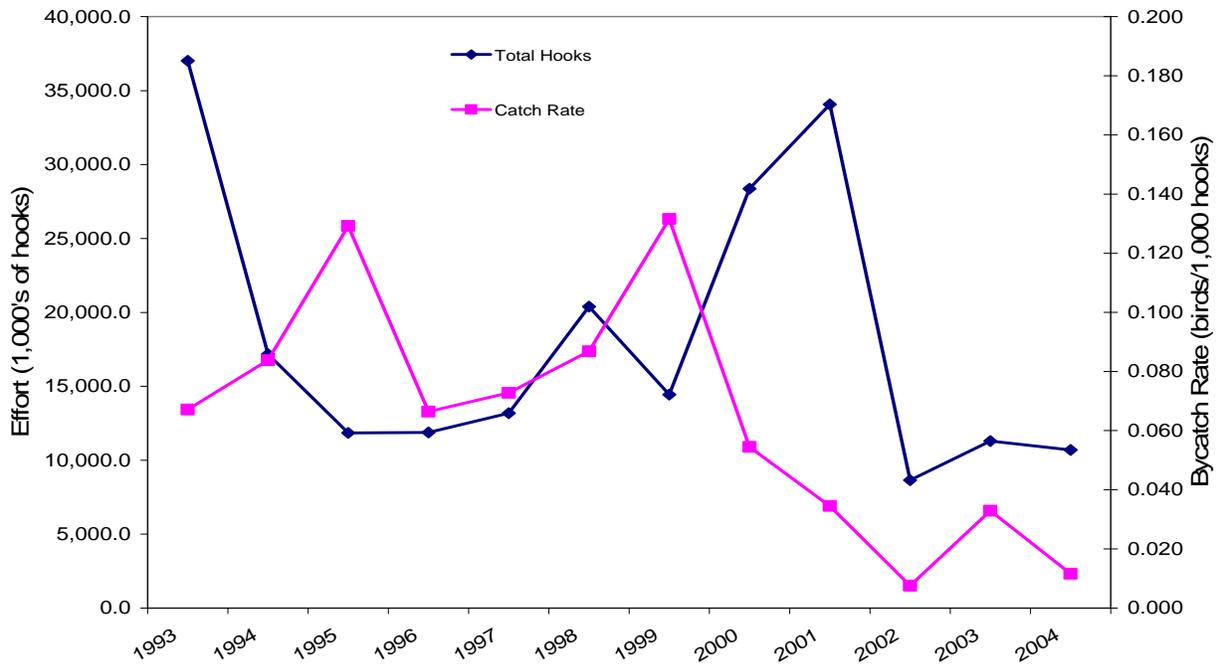


Figure 3. Total estimated hooks (in thousands) and bycatch rate of birds (birds per 1,000 hooks) in the Aleutian Islands Region demersal groundfish longline fishery.

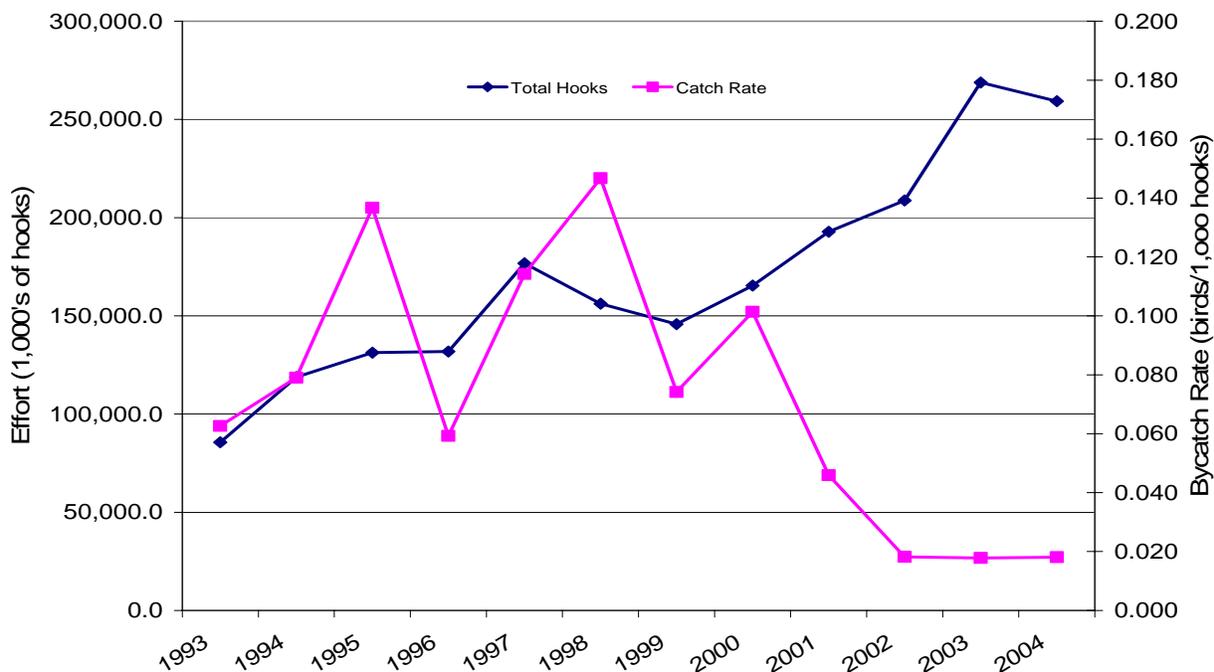


Figure 4. Total estimated hooks (in thousands) and bycatch rate of birds (birds per 1,000 hooks) in the Bering Sea Region demersal groundfish longline fishery.

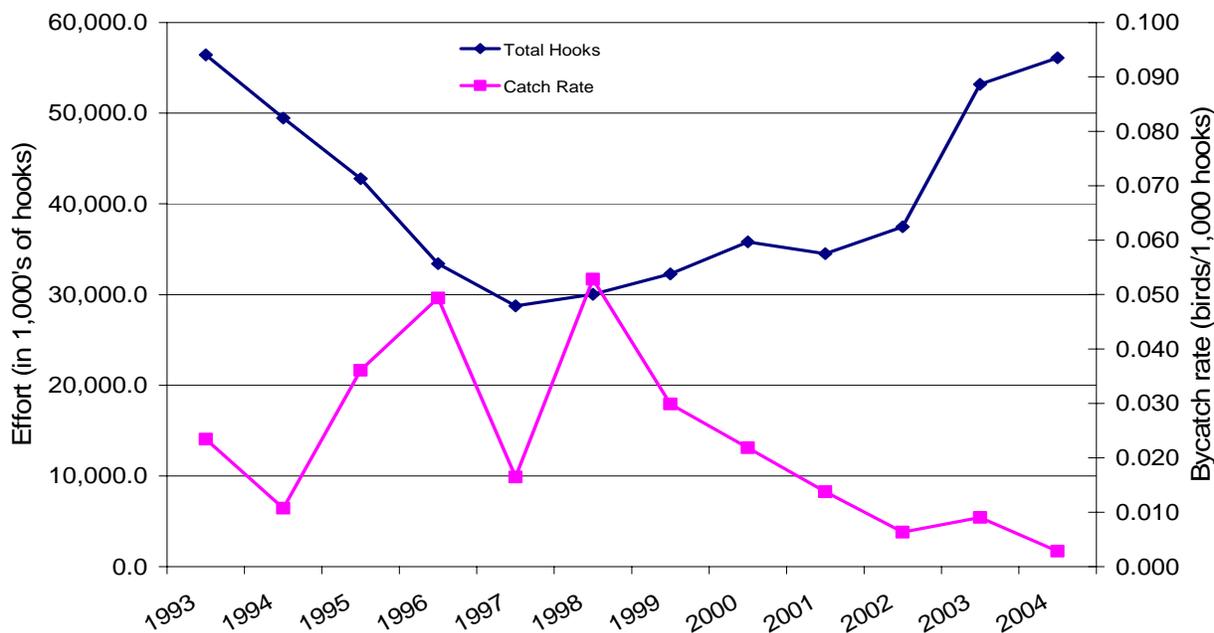


Figure 5. Total estimated hooks (in thousands) and bycatch rate of birds (birds per 1,000 hooks) in the Gulf of Alaska Region demersal groundfish longline fishery.

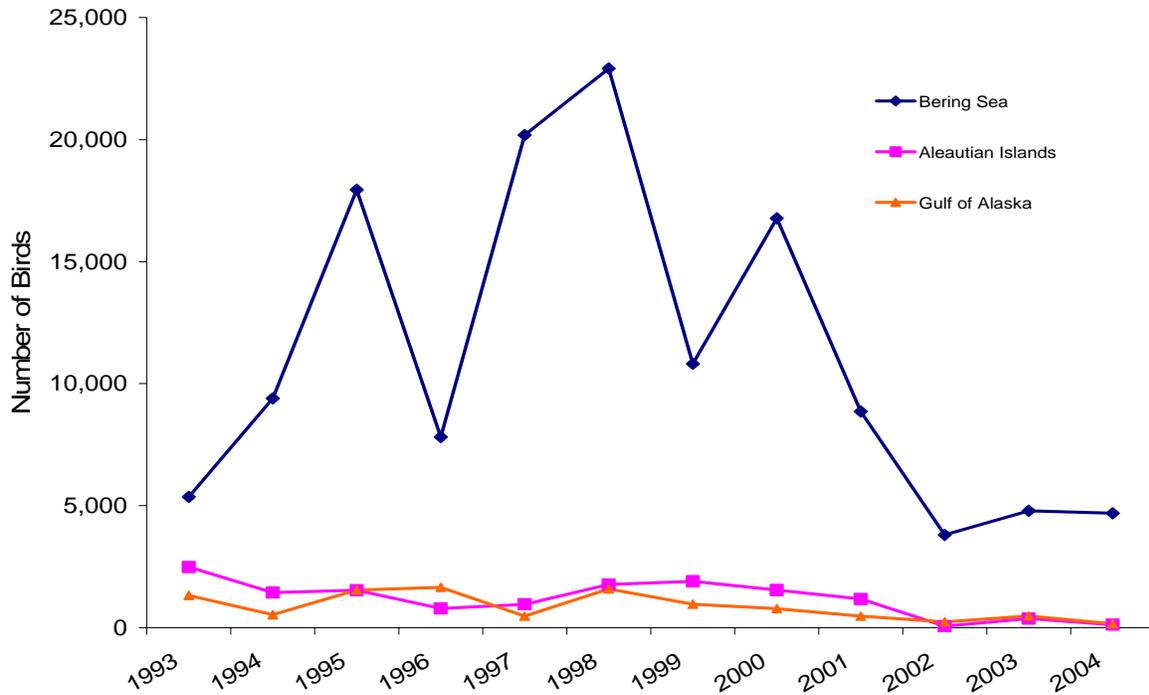


Figure 6. Seabird bycatch in the demersal groundfish longline fisheries by Fishery Management Region.

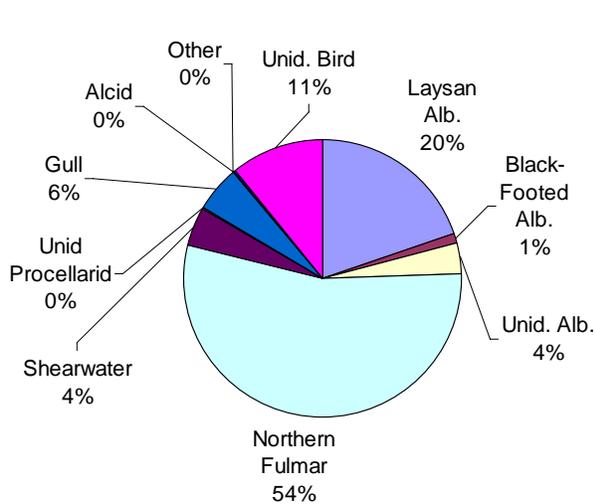


Figure 7. Species composition of seabird bycatch in the Aleutian Island Area demersal groundfish longline fishery using the average annual estimates, 1993 through 2004.

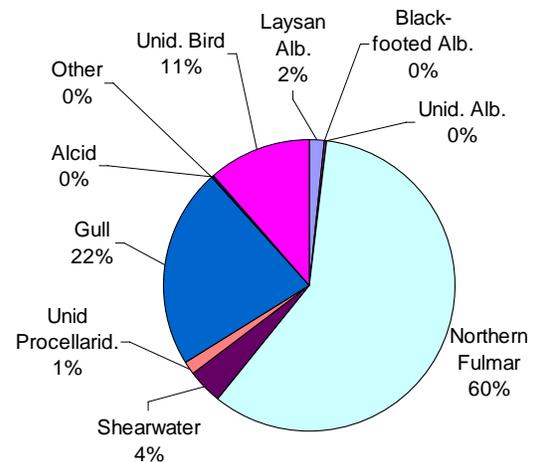


Figure 8. Species composition of seabird bycatch in the Bering Sea Area demersal groundfish longline fishery using the average annual estimates, 1993 through 2004.

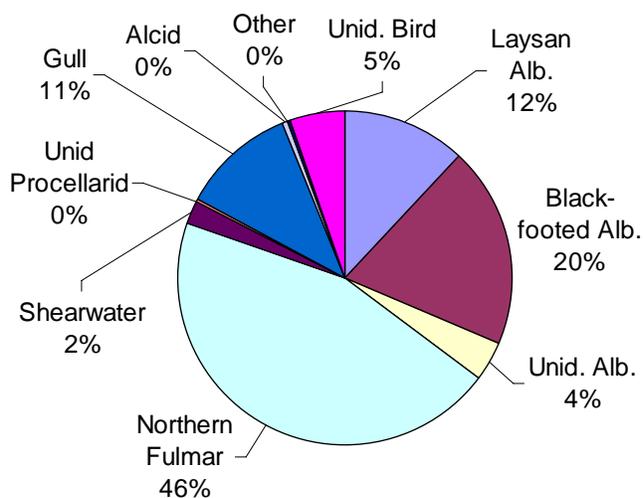


Figure 9. Species composition of seabird bycatch in the Gulf of Alaska Area demersal groundfish longline fishery using the average annual estimates, 1993 through 2004.

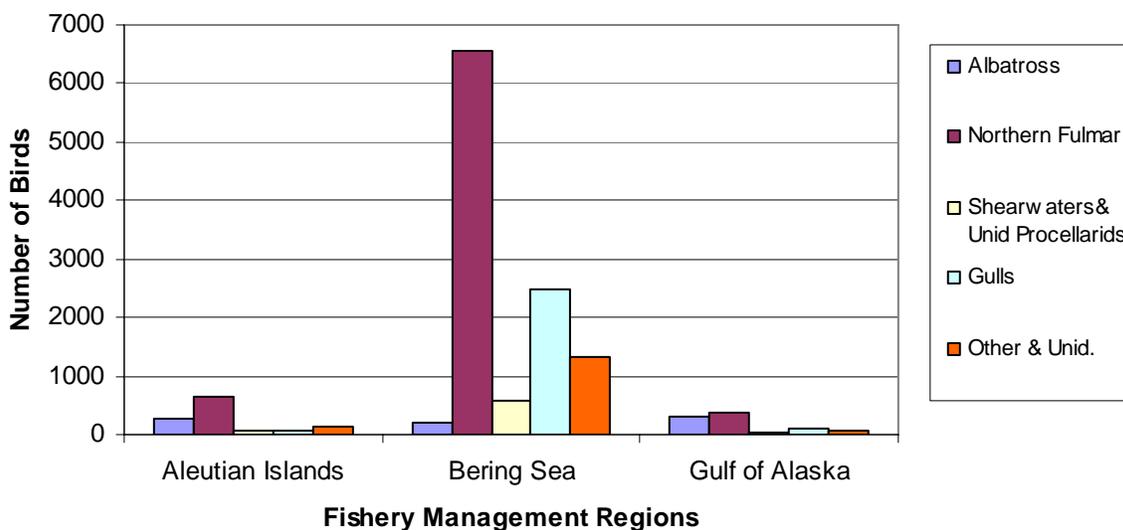


Figure 10. Estimated seabird bycatch summarized by species or species group for Alaskan demersal longline groundfish fisheries by fishery management regions.

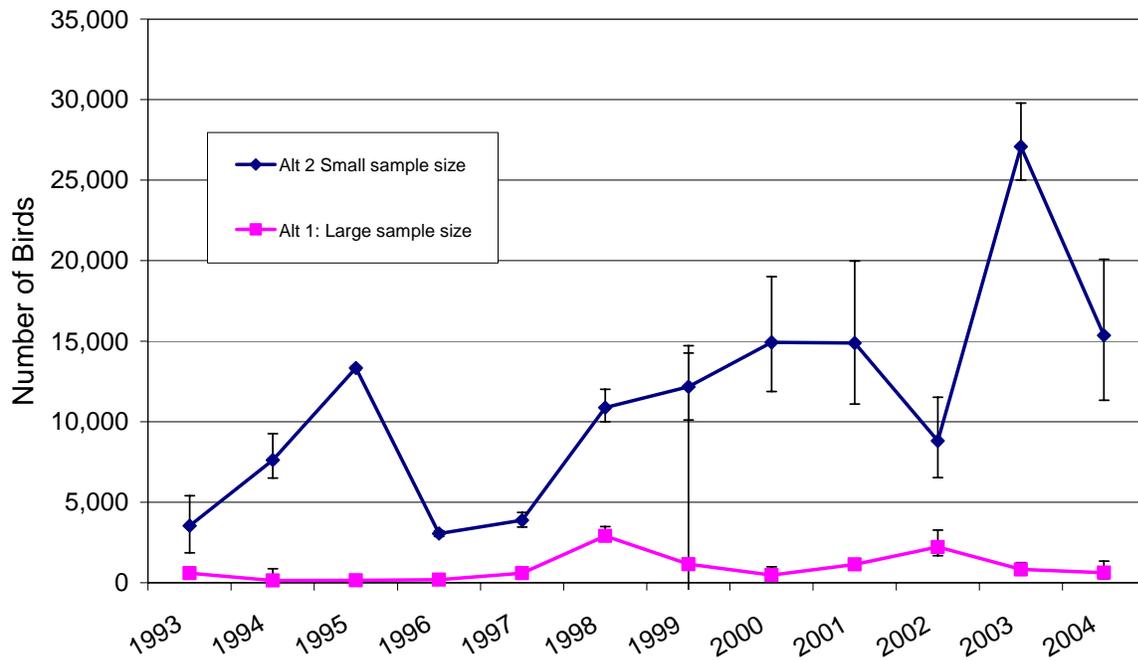


Figure 11. Seabird bycatch estimates for the Alaskan Groundfish Trawl fleet using two estimation procedures based on available sample sizes when no birds were observed. Data from 2004, when all sample sizes were recorded, closely approximates the Alternative 1 estimate.

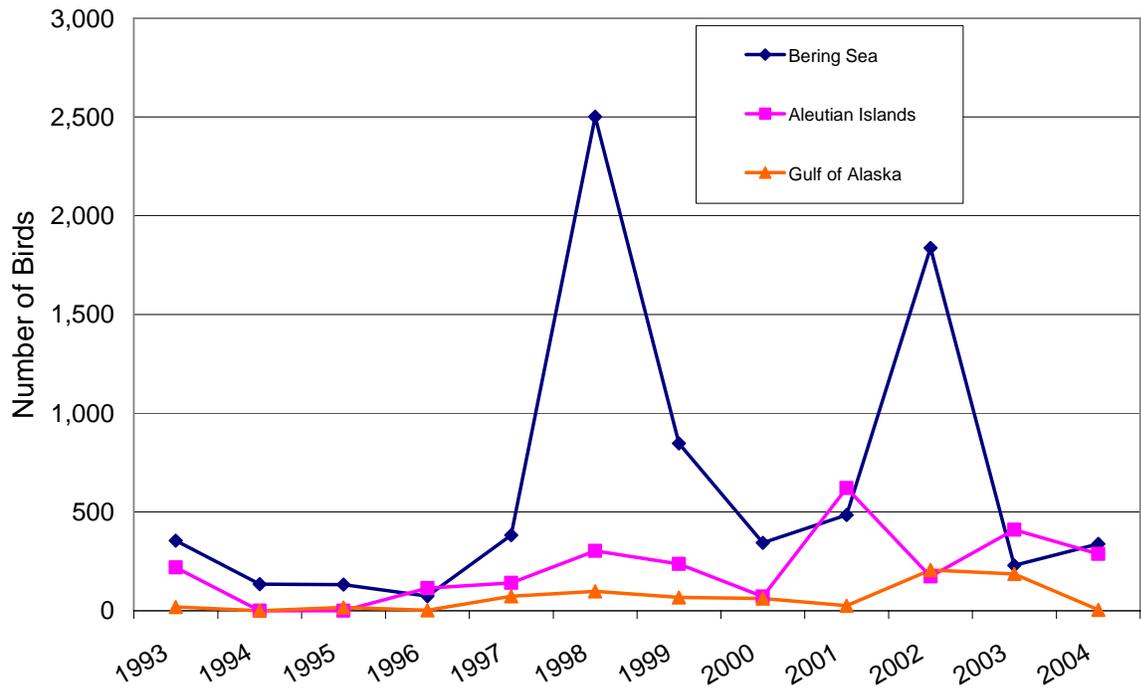


Figure 12. Seabird bycatch in groundfish trawl fisheries by area, using alternative 1 estimates.

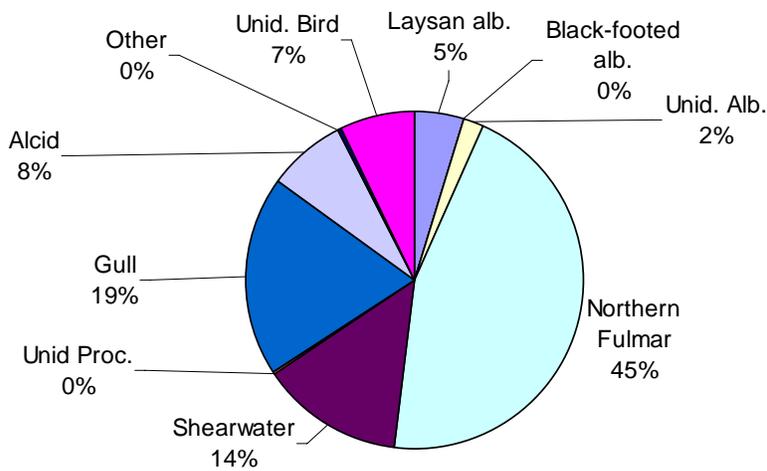


Figure 13. Species composition of seabird bycatch in the combined Alaskan groundfish trawl fisheries using the average annual estimates, 1993 through 2004.